

REQUEST FOR RECONSIDERATION

Applicants thank Examiner Price for the helpful and courteous discussion of August 5, 2004. During the discussion, Applicants' U.S. representative presented arguments that the claimed invention is drawn to a method that may be used for treating waste solutions that may contain ionic fluorocarbon materials (e.g., fluorinated surfactants) such as perfluorooctanoic acid. The invention treatment process effectively removes the fluorocarbon materials by forming a layered double hydroxide compound as a complex between the fluorocarbon compound and any divalent and/or trivalent metal salts added to the waste solution.

The process of the original claims is a "treatment process." The treatment process is described as follows in the specification:

Present invention relates to a treatment process reducing a burden to environment and ecosystem about a solution containing a molecular anion having a per-fluorocarbon chain as a main component. (Page 1, lines 1-3).

Specifically, the present invention provides the treatment technology fixing to recover efficiently the anion having the per-fluorocarbon chain as the main component...from the aqueous solution having the wide concentration range including the dilute aqueous solution of 0.1% by weight. (Page 3, lines 7-17)

In addition, according to this treatment process, even when the concentration of the anion aqueous solution of the surface-active agent having the per-fluorocarbon chain is less than several percent by weight, for example, very low concentration of about 0.01% by weight, this fluorine compound can be fixed with a very high rate of more than 90%. Moreover, as the adding metal salt, the safe salt to environment can be used, and the recovered layered double hydroxide is a solid, so that it can be process advantageously in transportation or storage by drying. (Page 6, lines 11-24).

Because the treatment process inherently requires the removal of the organic compound having a fluorocarbon chain, it is an implicit limitation of each of the original claims which are drawn to a "treatment process" that the organic compound having a

fluorocarbon chain is separated from the solution so that the concentration of the organic compound having a fluorocarbon chain in the solution is reduced.

The Office rejected the present claims as obvious in view of a combination of Franklin (WO 94/10973) and Hiroaki (translation of Abstract presented at the 76th Spring Meeting of the Chemical Society of Japan (1999), Tokyo, Japan). Applicants traverse the rejection on the grounds that neither Hiroaki nor Franklin discloses a treatment process which removes organic compounds having fluorinated carbon chains from solution.

Hiroaki discloses that two preparation routes were investigated for forming layered double hydroxide (LDH) compounds of fluorinated surfactants. The preparations described may be via (i) an ion exchange or (ii) coprecipitation method. The methods of preparation are described as:

After preparing the HC-LDH, the ion exchange reaction proceeded with two-fold amount of the fluorinated surfactant for 1 day, and also for 7 days. On the other hand, the synthesis by the coprecipitation method was carried out using the surfactant of 1.2 fold in molar as much as the Al³⁺ ions embedded in the hydroxide sheet.

Therefore, in Hiroaki, methods are described for forming a fluorinated surfactant complex with an LDH by adding the fluorinated compound to a solution containing a trivalent metal ion. A method of adding divalent or trivalent metal salts to a solution containing an organic compound having a fluorocarbon chain is not disclosed.

Importantly, Hiroaki does not mention and does not suggest that fluorinated surfactants may be fixed and removed from solution by forming a LDH. In fact, in the preparation methods of Hiroaki an excess (e.g., "1.2 fold in molar") of the fluorosurfactant is present. Therefore the Hiroaki method would obviously not be effective as a treatment process for removing fluorocarbon surfactants from solution because the fluorocarbon material is actually added in excess to the solution.

Further with regards to the Hiroaki Abstract, this reference is discussed in the original specification as follows:

In addition, the inventors have already reported the layered double hydroxide having anion between layers ($\text{Zn}_2\text{Al}(\text{OH})_6\text{C}_7\text{F}_{15}\text{CO}_2$) for the purpose of a material synthesis (the 76th spring annual meeting of the Chemical Society of Japan), about a high concentration aqueous solution of per-fluoro-octanoic acid ammonium, i.e., about 8.6% by weight. However, this report was not for the purpose of fixing and recovering of the anion like this invention, about the solution having the wide concentration range including the dilute solution of 0.1% by weight. Therefore, the process about fixing of such fluorine compound has not been reported yet.

Therefore, in the specification as originally filed it is stated that the process of Hiroaki is not the same as the claimed process because the disclosure of Hiroaki is “not for the purpose of fixing and recovering” an organic compound having a fluorocarbon chain.

Franklin discloses a method of preparing an occlusive gel. The preparation of these materials is described for example at page 5, lines 14-19 where it is disclosed:

Monocarboxylate, sulfonate, alkyl sulfate or alkyl ether sulfonate ions may be introduced into the layered double hydroxide by ion exchange where using the partial decomposition-reformation procedure described by ...

Therefore the synthesis procedure in Franklin is one in which the carboxylate (e.g., a surfactant) is added to a solution or mixture containing the LDH. The Franklin process is not one in which metal salts are added to a solution containing a surfactant. The prior art synthesis procedure is demonstrated in Example 1 - Zn/Al Hydroxy Nitrate in the paragraph bridging pages 6 and 7 where a solution of potassium laurate is added to a Zn/Al hydroxy nitrate LDH mixture.

Importantly, in Franklin the surfactant-LDH complex is not separated from the water. Instead, the surfactant-LDH complex forms a gel with the water. Therefore in Franklin there is no removal of a fixed surfactant from solution and the prior art method actually keeps the surfactant-LDH complex in contact with water in a gel form.

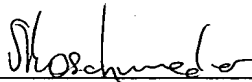
The disclosures cited above evidence that both of Hiroaki and Franklin describe processes wherein either an excess of a surfactant is present or a surfactant is added to a divalent or trivalent metal salt. Each of these processes is oriented to providing a synthesis method to a surfactant complex. Neither method is directed towards scavenging, removing or fixing residual amounts of a fluorinated organic surfactant from solution.

Applicants submit that the claimed invention which requires that a divalent or trivalent metal salt be added to a solution containing an organic compound having a fluorocarbon chain to remove or reduce the amount of the organic compound in solution is not obvious in view of prior art references which (i) must necessarily leave substantial amounts of fluorinated surfactant in solution because an excess of the surfactant is present and (ii) one method which yields an occlusive gel which does not function to separate a surfactant-LDH complex from solution but rather to jellify the solution including the surfactant in a homogenous mass (i.e., the reference does not describe removing a fluorocarbon from solution but instead describes trapping the fluorocarbon in a gelled solution).

Applicants submit the claimed invention is not obvious in view of the prior art relied upon by the Office and respectfully request the withdrawal of the rejections.

Respectfully submitted,

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